Original Article

Factors Influencing Excessive Daytime Sleepiness among Undergraduate Nursing Students: A Cross-Sectional Study from North Sulawesi, Indonesia

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Abstract

Background: Excessive daytime sleepiness (EDS) is a common yet underrecognized concern among nursing students, potentially impairing academic performance and clinical readiness. Identifying factors associated with EDS is essential to inform preventive strategies and promote optimal student functioning.
Objective: This study aimed to identify the factors influencing EDS among undergraduate nursing students in North Sulawesi, Indonesia.
Methods: A descriptive correlational, cross-sectional design was employed. This study involved 101 students from a university in North Sulawesi Province, Indonesia, selected through consecutive sampling. Data were collected using the Epworth Sleepiness Scale (ESS) and analyzed using descriptive statistics, the Mann–Whitney U test, Kruskal–Wallis H test, Spearman's correlation, and multiple linear regression.
Results: The mean ESS score was 12.98 (SD=4.07), with 71 respondents (70.3%) classified as experiencing EDS. Caffeine consumption (B=3.458, β=0.295, 95% CI [1.232, 5.684], p=0.003) significantly predicted EDS, accounting for 14.9% of the variance.
Conclusion: These findings highlight the need to address modifiable lifestyle factors, particularly caffeine intake, to reduce EDS among nursing students. Nurse educators and academic institutions should implement sleep health education and promote healthy coping strategies to mitigate daytime sleepiness. Early intervention may enhance students' academic performance and clinical competence, ultimately improving patient safety and quality of care in future nursing practice.

Keywords: COVID-19, Demographic Factors; Excessive Daytime Sleepiness; Indonesia; Nursing Students

INTRODUCTION

Excessive daytime sleepiness (EDS) is a common yet often overlooked issue among undergraduate students, especially those in demanding fields like nursing. Defined by a persistent tendency to fall asleep during the day, EDS can negatively affect academic performance, cognitive abilities, and psychosocial health (1,2). Nursing students are particularly vulnerable due

to factors such as extended study hours, night shifts during clinical practice, and psychological stress. Identifying the key contributors to EDS in this group is essential for developing effective interventions and support strategies (3).

Various demographic and lifestyle factors influence EDS in college students. Age and sex affect sleep patterns, with adolescents and females often experiencing more sleep disturbances (4). Academic year may also play a role, as higher levels often bring greater clinical and academic demands (3). Furthermore, living arrangements, such as living alone versus with family can impact daily routines and sleep hygiene, thereby influencing daytime alertness (5,6).

Spirituality, though often overlooked, may influence sleep quality and stress regulation. Higher spiritual well-being has been associated with better coping and improved sleep outcomes (7,8). Relationship status also appears to impact daytime sleepiness (9). Additionally, lifestyle factors such as regular physical activity, caffeine intake, and screen use, particularly handphone use before bedtime, are strongly linked to sleep patterns and EDS in youth (10,11). Biological factors such as body mass index (BMI) also contribute, as higher BMI is linked to increased risk for sleep-related disorders such as obstructive sleep apnea (12).

The COVID-19 pandemic further intensified sleep disturbances among students due to prolonged screen exposure, social isolation, and elevated stress levels from online learning and fear of illness (6,13). Post-infection symptoms such as fatigue may persist, potentially exacerbating EDS (14).

While previous studies have identified predictors of EDS in student populations, limited research has examined these associations specifically among nursing students in low- and middle-income countries, including Indonesia. Furthermore, the combined impact of spirituality, lifestyle habits, and COVID-19 related variables on EDS remains underexplored.

Therefore, this study aims to investigate the demographic, lifestyle, and COVID-19 related factors influencing EDS among undergraduate nursing students in North Sulawesi, Indonesia. The findings are expected to contribute to the development of targeted interventions and inform institutional policies to support students' sleep health and academic performance.

METHODS

Study Design

This study utilized a correlational design with a cross-sectional approach.

Sample

Respondents were selected using a consecutive sampling technique from a nursing school at a university in North Sulawesi (Indonesia), in February 2023. The inclusion criteria included undergraduate nursing students who were willing to participate in the study. Students who were ill or absent during the data collection period were excluded. The sample size was determined using G*Power software version 3.1.9.7 (15). Using linear multiple regression analysis, with an effect size based on study by Huang et al. (16), a power of 0.90, an alpha level of 0.05, and 12 predictors, the minimum required sample size was 49. Ultimately, 101 students participated in the study.

Instruments

Respondent characteristics were collected through a self-constructed questionnaire that included items on age, gender, academic year, type of residence, spirituality, relationship status, body mass index (BMI), regular exercise, caffeine intake, mobile phone usage, sleeping in a dark room, and history of COVID-19 infection.

The Epworth Sleepiness Scale (ESS) was used to assess daytime sleepiness among nursing students (17). This self-administered questionnaire consists of 8 items, each evaluating the likelihood of dozing off in various everyday situations, with responses rated on a scale from 0 to 3 (0=Would never doze, 1=Slight chance of dozing, 2=Moderate chance of dozing, 3=High chance of dozing). The total score ranges from 0 to 24, with higher scores indicating greater daytime sleepiness. Scores were categorized as follows: 0-10 for normal daytime sleepiness and 11-24 for severe daytime sleepiness. In this study, the ESS demonstrated a Cronbach's alpha of 0.662. Although slightly below the conventional threshold of 0.70, this value is considered acceptable for exploratory research and scales with a limited number of items. Reliability values ranging from 0.45 to

0.98 may be acceptable depending on the instrument's purpose and design (18).

Data Collection

Eligible students were identified through referrals from the administrator of nursing program. Students who showed interest were individually contacted by the researcher. Prior to participation, informed consent was obtained electronically. Students were required to read and agree to the consent form before accessing the survey. Participation was entirely voluntary, and all data were collected anonymously and treated with strict confidentiality.

Data Analysis

Data were analyzed using descriptive and inferential statistical methods. Descriptive statistics including frequencies, percentages, means, and standard deviations were used to describe respondents' characteristics and key variables. The Kolmogorov–Smirnov test indicated that the data were not normally distributed, therefore, non-parametric tests were employed. The Mann-Whitney U test and Kruskal-Wallis H test were used to compare daytime sleepiness scores across categorical variables, while Spearman's rank correlation was applied to assess relationships between continuous or ordinal variables and sleepiness scores. These tests were selected due to their robustness in handling skewed distributions and ordinal data types. Multiple linear regression analysis was performed to identify significant predictors of daytime sleepiness. Variables that showed a bivariate association with daytime sleepiness at $p<0.25$ were included in the regression model. Prior to regression analysis, type of residence were transformed into dummy variables, with one category from being selected as the reference group. Multicollinearity was assessed using variance inflation factor (VIF) and tolerance values, all of which fell within acceptable limits (VIF < 5 and tolerance > 0.20), indicating no multicollinearity among predictors. Model fit was evaluated through adjusted R^2 and residual analysis. A level of $p<0.05$ was used to determine statistical significance.

Ethical Considerations

This study received ethical clearance from the university's Institutional Review Board (No. 282/KEPK-FIK/EC/II/23).

RESULTS

Desciption of Respondents' Characteristics

Table 1 shows that the mean daytime sleepiness score among respondents was 12.98 (SD=4.07), with scores ranging from 3 to 24. Based on ESS classification, 70.3% of respondents (n=71) experienced EDS. Among the individual items, the highest mean score was reported for item 5 (lying down to rest in the afternoon) at 2.36 (SD=0.82), followed by item 7 at 2.02 (SD=0.97). The lowest score was found for item 8 (stop for a few minutes in the car during traffic) with a mean of 0.72 (SD=0.97).

Table 1. Description of Daytime Sleepiness among Respondents (n=101)

No.	Item	n	%	Mean	SD	Min-Max
1.	Sitting and reading			1.85	0.85	0-3
2.	Watching television			1.72	0.91	0-3
3.	Sitting inactive in a public place (e.g., a theater or a meeting)			1.23	1.01	0-3
4.	As a passenger in a car for an hour without a break			1.93	1.01	0-3
5.	Lying down to rest in the afternoon when circumstances permit			2.36	0.82	0-3
6.	Sitting and talking to someone			1.15	0.89	0-3
7.	Sitting quietly after lunch without alcohol			2.02	0.97	0-3
8.	In a car, while stopped for a few minutes in traffic			0.72	0.97	0-3
	Daytime Sleepiness			12.98	4.07	3-24
	Normal DS	30	29.7			
	EDS	71	70.3			

Note: EDS=Excessive Daytime Sleepiness.

The Association between Respondents Characteristics and Daytime Sleepiness

Table 2 presents the results of association between respondent characteristics and daytime sleepiness scores among undergraduate nursing students. The findings indicated no significant associations between daytime sleepiness and age (r=0.067, p=0.505), gender (U=787.500, p=0.718), academic year (H=3.579, p=0.311), type of residence (H=3.909, p=0.142), spirituality (U=980.000, p=0.210), relationship status (U=1245.500, p=0.872), body mass index (r=-0.068, p=0.498), regular exercise (U=597.500, p=0.910), intensity of mobile phone use (U=1021.500, p=0.291), or history of COVID-19 infection (U=978.500, p=0.245). However, a statistically significant association was found between caffeine consumption and daytime sleepiness (U=863.500, p=0.012), with students who reported caffeine consumption exhibiting higher mean scores of daytime sleepiness (M=15.64, SD=4.68) compared to non-consumers (M=12.55, SD=3.81).

Table 2. The Association between Respondents Characteristics and Daytime Sleepiness (n=101)

Variables	n	%	Daytime Sleepiness		*U/H/r*	*p-value*
			Mean	SD		
Age [M=19.68 years, SD=1.61, range 17-24]					0.067	0.505
Gender					787.500	0.718
Male	18	17.8	12.67	4.29		
Female	83	82.2	13.05	4.03		
Academic Year					3.579	0.311
1st Grade	34	33.7	12.47	4.15		
2nd Grade	19	18.8	14.21	3.34		
3rd Grade	20	19.8	12.10	4.71		
4th Grade	28	27.7	13.39	3.87		
Type of Residence					3.909	0.142
Rent	30	29.7	12.50	3.50		
House	29	28.7	14.17	3.91		
Dorm	42	41.6	12.50	4.45		
Spirituality					980.000	0.210
Poor	35	34.7	12.40	4.23		
Good	66	65.3	13.29	3.97		
Relationship Status					1245.500	0.872
Single	54	53.5	13.13	4.09		
In Relationship	47	46.5	12.81	4.07		
Body Mass Index [M=21.54 kg/m^2, SD=3.78), range 16.1-34.8]					-0.068	0.498
Regular Exercise					597.500	0.910
No	87	86.1	12.98	4.04		
Yes	14	13.9	13.00	4.36		
Caffeine Consumption					863.500	0.012*
No	87	86.1	12.55	3.81		
Yes	14	13.9	15.64	4.68		
Intensity of Mobile Phone Use					1021.500	0.291
Less	36	35.6	12.50	3.96		
High	65	64.4	13.25	4.12		
History of COVID-19 Infection						
No	80	79.2	12.74	4.27	978.500	0.245
Yes	21	20.8	13.90	3.06		

*Note: *p<0,05; **p<0,01; ***p<0,001; COVID-19=Coronavirus Disease 2019; H=Kruskal-Wallis H test; U=Mann-Whitney U test; r=Spearman Correlation.*

Determinants of EDS among Respondents

A multiple linear regression analysis was conducted to examine factors influencing EDS among respondents (Table 3). Caffeine consumption was found to be a significant positive determinant (B=3.458, β=0.295, 95% CI [1.232, 5.684], p=0.003). Other variables, including spirituality (B=-1.335, β=-0.157, p=0.107), residential status (dorm: B=0.083, β=0.010, p=0.929; house: B=1.740, β=0.195, p=0.087), and history of COVID-19 infection (B=1.687, β=0.169, p=0.082), were not statistically significant. The overall model was statistically significant, F(5, 95)=3.34, p=0.008, accounting for 14.9% of the variance in EDS (R^2=0.149).

Table 3. Determinants of EDS among Respondents (n=101)

Variables	B	ß	95% CI	VIF
Residence (Dorm)[1]	0.083	0.010	-1.749, 1.915	1.411
Residence (House)[1]	1.740	0.195	-0.258, 3.739	1.415
Spirituality	-1.335	-0.157	-2.966, 0.295	1.042
Caffeine Consumption	3.458*	0.295	1.232, 5.684	1.024
History of COVID-19 Infection	1.687	0.169	-0.220, 3.593	1.036
F	3.340			
R^2	0.149			
ΔR^2	0.105			
R^2 *Change*	0.149**			

*Note: *p<0,05; **p<0,01; ***p<0,001; COVID-19=Coronavirus Disease 2019, CI=Confidence Interval, VIF=Variance Inflation Factors, [1]=Reference group: Rent.*

DISCUSSION

The high prevalence of EDS observed in this study aligns with existing literature, which reports excessive sleepiness as a common complaint among university students due to academic stress, irregular sleep patterns, and psychosocial pressures (11,19). For nursing students, the additional demands of clinical rotations, night shifts, and screen fatigue may further contribute to poor sleep quality and increased sleep deficit. EDS is not merely a benign condition, it has been associated with impaired attention, reduced academic achievement, and increased risk of clinical errors (20–24).

Among the variables examined, caffeine consumption emerged as the only significant predictor of EDS, aligning with earlier studies. While often used to combat fatigue, caffeine especially when consumed in the late afternoon or evening can interfere with sleep onset and quality, paradoxically leading to increased daytime drowsiness (25–28). Repeated use may also result in physiological tolerance, requiring higher intake that further disrupts sleep (29). These findings underscore the need for targeted sleep health education in nursing programs, emphasizing moderation in caffeine use and the long-term implications of poor sleep hygiene for clinical safety and student well-being (2,30).

Notably, variables such as place of residence and spirituality did not show statistically significant associations with EDS in this study. Previous studies have suggested that living away from family can negatively impact sleep routines due to increased autonomy and irregular habits (23,31–33). However, in this context, students may have adapted through support networks, shared living arrangements, or established personal routines, mitigating potential adverse effects.

Similarly, while prior literature has linked higher levels of spiritual well-being to better emotional regulation and sleep outcomes (7,34–36), no significant relationship was found in this study. This may reflect the multifaceted nature of spirituality among nursing students, where religious or spiritual practices may be present but not deeply integrated into daily coping mechanisms. Additionally, cultural nuances in the expression of spirituality, as well as its possible underreporting in academic settings, could explain the lack of association observed in this sample.

Although COVID-19 infection history was not a significant predictor, its inclusion remains

important given established links between post-COVID fatigue and sleep disturbances (14,37–40). As the pandemic continues to shape students' physical and mental health, ongoing research is needed to monitor its evolving effects on sleep and academic functioning.

Study Limitations

This study has several limitations that should be considered when interpreting the results. The cross-sectional design restricts the ability to draw causal inferences, as it captures associations at a single point in time. Although caffeine consumption was found to be a significant determinant of excessive daytime sleepiness, other potentially relevant factors such as undiagnosed sleep disorders, academic stress, or screen time before sleep were not assessed. The use of consecutive sampling and self-reported questionnaires may have introduced selection and response biases. Furthermore, the study was conducted in a single school of nursing, which limits the generalizability of the findings to nursing students in other academic institutions or regions.

CONCLUSION

This study found that the majority of nursing students experienced EDS, with caffeine consumption emerging as a significant contributing factor. These findings highlight the importance of promoting healthy sleep hygiene and lifestyle habits, particularly the moderation of caffeine intake to support students' overall well-being and academic performance. Health promotion within nursing programs should prioritize education on the relationship between sleep and cognitive function, equipping students with strategies to maintain alertness and manage fatigue effectively in both academic and clinical settings.

Future research should employ longitudinal designs across diverse institutions to better understand causal pathways between EDS and factors such as academic stress, sleep hygiene, physical activity, and mental health. Additional exploration of chronotype and nighttime screen exposure could also offer valuable insights, given their established links to sleep disruption. Broadening the geographic scope of future studies would further enhance generalizability. Institutions may use these findings to develop evidence-based wellness policies, including sleep education campaigns and caffeine reduction initiatives, to foster healthier learning environments for nursing students.

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Author Contributions

P.M.S. conceptualized and designed the study, supervised data collection, and drafted the initial manuscript. F.L. contributed to data analysis, interpretation of results, and critical revision of the manuscript. B.-H.W. provided methodological guidance, reviewed the manuscript critically for intellectual content, and contributed to the final approval of the version to be published. All authors have read and approved the final manuscript.

Conflict of Interest Disclosure

The authors declare no conflict of interest related to the research, authorship, and/or publication of this article.

Data Availability Statement

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

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